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LER 311/04-007-01
SALEM - UNIT 2
FACILITY OPERATING LICENSE NO. DPR-75
DOCKET NO. 50-311

This Licensee Event Report, "Salem Unit 2 Manual Reactor Trip Due to a Malfunction of a Main Feedwater Regulating Valve (23BF19)," is being submitted to incorporate the failed equipment model number and to expand on the root cause of the event as a result of additional information obtained.

The attached LER contains no commitments.

Sincerely,



Carl Fricker
Salem Plant Manager

Attachment

/EHV

C Distribution
 LER File 3.7

IE22

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME Salem Generating Station Unit 2	2. DOCKET NUMBER 05000311	3. PAGE 1 OF 5
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4. TITLE

Salem Unit 2 Manual Reactor Trip Due to a Malfunction of a Main Feedwater Regulating Valve (23BF19)

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
07	15	2004	2004	- 007 -	01	03	14	2005	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)									
10. POWER LEVEL 8%	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)						
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 50.73(a)(2)(xi)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)						
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)						
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> OTHER							
Specify in Abstract below or in NRC Form 366A										

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME E. H. Villar, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) 856-339-5456
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

_____	_____	_____	_____	_____	CAUSE	_____	_____	_____	_____
■	■	■	■	■					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO15. EXPECTED
SUBMISSION
DATE

MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On Thursday July 15, 2004, Salem Unit 2 was manually tripped while returning to power following the July 13, 2004 automatic reactor trip (LER 311/2004-006, dated September 13, 2004). During start-up, at approximately 8% power, feedwater flow was automatically transitioning from the feedwater bypass valve (BF40) to the main feedwater regulating valves (BF19). As the demand for the main feedwater regulating valves increased the demand for the BF40s decreased, as designed. However, the actual position of the number 23 loop main feedwater regulating valve (23BF19) did not move in response to the increasing demand. As the level in 23 Steam Generator continued to decrease due to the lack of response from 23BF19, the control room operator manually initiated a reactor trip with 23 Steam Generator level at approximately 16%. The failure of the valve was determined to be a positioner failure (Bailey model number AV2320200) due to sticking of the positioner pilot stem because of poor/ineffective vendor quality control allowing uneven surface finishing and dimensions that cause sticking of the positioner pilot stem.

Some of the corrective actions taken were: (1) The 23 BF19 positioner, as well as all Unit 2 feedwater regulating valves (21, 22, and 24BF19s), were replaced and calibrated under direction of the manufacturer, (2) The overshoot condition for the Unit 2 BF19s positioners was corrected prior to Unit restart, (3) A rollout was performed with appropriate PSEG personnel with specific recommendations to test each positioner pilot spool. Some longer term corrective actions being considered include: (1) Replacing the positioners with a different design and (2) Installing in line air filters (in parallel) at the redundant air panels for the BF19s.

This report is being made in accordance with 10CFR50.73(a)(2)(iv)(A), "any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B)."

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7. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

PLANT AND SYSTEM IDENTIFICATION

Feedwater Steam Generator level Control {JB/FCV}{BF}

* Energy Industry Identification System {EIIIS} codes and component function identifier codes appear as {SS/CCC}

IDENTIFICATION OF OCCURRENCE

Event Date: July 15, 2004

Discovery Date: July 15, 2004

CONDITIONS PRIOR TO OCCURRENCE

Salem Unit 2 was in Mode 1(POWER OPERATION) at approximately 8% power at the time of the event. No structures, systems or components were inoperable at the time of the occurrence that contributed to the event.

DESCRIPTION OF OCCURRENCE

On Thursday July 15, 2004, Salem Unit 2 was manually tripped, while returning to power following the July 13, 2004 automatic reactor trip (LER 311/2004-006, dated September 13, 2004) due to the failure of one of its feedwater regulating valves {JB/FCV}.

On Wednesday July 14, during testing of the feedwater regulating valves as a result of the July 13 trip, the 23BF19 valve failed to respond during testing to validate that the digital feedwater system was operating properly. The valve failed to stroke after several attempts at resetting the control signal. The failure mechanism appeared to be a stuck shuttle valve. The positioner manufacturer was contacted for assistance. The positioner was replaced and an air operated valve diagnostic test was performed without any additional problems. The new positioner was calibrated with the manufacturer on site. The old positioner was removed and sent to the manufacturer for additional testing that identified no additional problems with the positioner.

On Thursday July 15, 2004, at approximately 8% power, feedwater flow was automatically transitioning from the feedwater bypass valve (21BF40) to the main feedwater regulating valves. As the demand for the main feedwater regulating valves increased the demand for the BF40s decreased, as designed. However, the actual position of the number 23 loop main feedwater regulating valve (23BF19) did not move in response to the increasing demand. As a result, 23 Steam Generator level decreased. The Licensed Nuclear Control Operator (NCO) placed the 23BF19 valve in manual to control level. The NCO manually increased the 23BF19 valve demand. At 60% open demand for the 23BF19 valve, the 23BF40 went fully closed as designed. However, the level in 23 Steam Generator continued to decrease because of the lack of response from 23BF19.

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DESCRIPTION OF OCCURRENCE (cont'd)

Because of the lack of response from the 23BF19 valve and the continued level decrease in the 23 Steam Generator, the NCO (licensed operator) initiated a manual reactor trip with 23 Steam Generator level at approximately 16%.

This report is being made in accordance with 10CFR50.73(a)(2)(iv)(A), "any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B)."

CAUSE OF OCCURRENCE

The failure of the valve was determined to be a positioner failure (Bailey model number AV2320200) due to sticking of the positioner pilot stem because of poor/ineffective vendor quality control allowing uneven surface finishing and dimensions that cause sticking of the positioner pilot stem.

The tight tolerances of the shuttle and block allow a clearance of as little as 0.000250". Poor manufacturing practices and overshoot of the pilot shuttle affected shuttle performance. Overshoot is when the inner surface of the outer land of the pilot extends beyond the edge of the block beyond the 0.030" setting. Overshoot is significant since coupled with the tight clearances and materials of construction, galling can occur.

The failure to implement timely and appropriate corrective actions as a result of industry Operating Experience (OE) 14584. Although this OE did not specifically address this issue, other quality issues associated with the Bailey AV2 positioner were identified.

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PREVIOUS OCCURRENCES

A review of reportable events for Salem and Hope Creek in the last two years identified the following reportable events involving the steam generator feedwater control system.

LER 311/2004-006 issued on September 13, 2004, described a Salem Unit 2 automatic reactor trip as a result of 21BF19 failing to control steam generator water level. The root cause of this event was determined to be the failure of the positioner due to the failure of the I/P.

LER 272/2003-003 issued on December 5, 2003, described a Salem Unit 1 Shutdown as a result of 14BF19 failing to control level because of being immovable. The root cause of this event was determined to be foreign material lodged between the valve plug and the inside diameter of the cage.

LER 272/2002-004 issued on January 13, 2003, described a Salem Unit 1 manual reactor trip as a result a Steam Generator Feedwater Pump (SGFP) runhack resulting from voltage decrease in the control power to its governor.

With the exception of LER 311/2004-006, the root causes for these events were different than the root cause for the event being reported in this LER, thus the corrective actions taken for these previous events would not have prevented this occurrence. The corrective actions associated with LER 311/2004-006 were appropriate and adequate; however, the investigation was not comprehensive and did not fully understand the failure of the positioner and take appropriate corrective actions to prevent recurrence.

SAFETY CONSEQUENCES AND IMPLICATIONS

There were no safety consequences associated with this event.

At Salem there are two valves in each main feed line that serve to isolate main feedwater flow following a steamline break; (1) the main feedwater regulator valve (BF19), which receives dual, separate train trip signals from the Plant Protection System on any safety injection signal and closes within 10 seconds (including instrument delays), and (2) the feedwater isolation valve (BF13) that also receives dual, separate train trip signals from the reactor protection system following a safety injection signal. The BF13 valves are motor operated and close within 32 seconds (including instrument delays). Additionally, the main feed water pumps receive dual, separate train trips from the protection system following a steam line break.

A review of this event determined that a Safety System Functional Failure (SSFF) as defined in NEI 99-02 did not occur.

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CORRECTIVE ACTIONS

1. The 23 BF19 positioner, as well as all other Unit 2 feedwater regulating valves (21, 22, and 24BF19s), were replaced and calibrated under direction of the manufacturer.
2. The overshoot condition for the Unit 2 BF19s positioners was corrected prior to Unit restart. The overshoot was corrected by the installation of a volume booster on the discharge of the positioner to reduce the backpressure from the actuator. A similar modification to the Unit 1 positioners will be performed during the next outage of sufficient duration.
3. An air operated valve diagnostic test was satisfactorily performed.
4. A rollout of Operating Experience 14854 to appropriate PSEG personnel was performed with specific recommendations to test each positioner pilot spool.
5. The current Operating Experience Program will be reviewed for enhancements.
6. Longer term corrective actions being considered include:
 - (a) Replacing the positioners with a different design and
 - (b) Installing in line air filters (in parallel) at the redundant air panels for the BF19s.

COMMITMENTS

This LER contains no Commitments.